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Weed Flora of Sugarcane (*Saccharum officinarum* L.) Crop Cultivated on High Fertile Soil of District Charsadda-Pakistan

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ABSTRACT

Sugarcane is the major crop of district Charsadda-Pakistan and weeds infestation is the most problematic factor responsible for low yield in sugarcane. For the purpose a field experiment was conducted to find out the important and most problematic weeds of Sugarcane crop using quadrate method in different sugarcane fields at DistrictCharsadda, Khyber Pakhtunkhwa, Pakistan. The data was collected during summer season,2021. Based on spatial data it is concluded that Cyperus rotundus L., Parthenium hysterophorus L., Trianthema portulacastrum L., Euphorbia helioscopia L., Convolvulus arvensis L., Brachianreptans (L.)., Amaranthus viridusL., Physalis minima L., Dactyoctenium aegyptium(L)., Amaranthus spinosusL., Portulaca oleracea L.,CynodondactylonL. and Solanum nigrum L., were the most abundant weeds of the studied fields. The relative weed densities (%) and relative frequencies (%) of all these weeds were calculated to quantify their importance values in descending order of their percentages as following: P.hysterophorus, T.portulacasrum, C.rotundus, E. helioscopia. C. arvensis, B.reptans, A.viridus, and S. nigrum. Similarly, the highest (35.1%) importance value recorded for C. rotundus and declared the most competitive weed of sugarcane at district Charsadda. The control of C. rotundus recommended for the farmers of the area for the outmost yield of sugarcane.

Keywords : quadrate, sugarcane, importance value (%), weed density, weed frequency (%)

INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) is a member of Poaceae family. According to Memon (1997-1998), it is the 2nd largest non-food grain cash-crop after cotton, in Pakistan, which occupies around 4% of the total cropped area and contributes 14% of value added by the major crops. Pakistan stands 5th in sugar producing countries of the world, as reported by Bhatti & Soomro *et al.* (1996).

Due to the importance of sugar in daily life, its cultivation is increasing. It is cultivated throughout Pakistan on an area of 964.5 thousand hectares with its production of 41,998.4 thousand tones but unlike other developed countries its per-acre yield continues to be as low as half of their output, due to the mismanagement of weed-control. Ibrahim (1984) reported that weeds cause 40% losses in cane-yield. Gravity of the weed problem becomes even more serious, when this crop has to stay in the fields for 10-12 months. Magnitude of yield-reduction, due to weeds, varies from place to place, country to country and region to region. Gupta (2012) noted that the weeds alone are responsible for causing as much as, 71% reduction in the total yield per hectar of sugarcane. Singh *et al*. (2005) observed that the critical period of weed-control is between 30 & 120 days after planting sugarcane. Weeds are uninvited plants growing in the cultivat-

ed crops. They compete and share with the principal, crop chiefly for light, nutrients, water and carbon dioxide, as observed by Anderson (1983). Schwerzel & Thomas (1971) recorded that they use three to four times more nitrogen, potassium and magnesium than a weed- free crop. They arise immediately during the period of germination of sugarcane. It was observed that even after germination, they grow rapidly and compete with the crop in its early stage of growth. Therefore, they reduce crop-yield as jointly reported by Hussain (1983) & Mahmood (1987) and for the achievement of excellent yield they are generally removed by various methods.

On the basis of these values, on a particular soil, under the given climatic condition, we are able to recognize the severity of weed-infestation and undertake farm-management of crops. Such type of work was not carried out previously in District Charsadda-Pakistan.

Out of the many problems confronting the sugarcane growers in the area, the one and by far the more important is the eradication of weeds from the cane fields. Weeds make precisely the same demand from the soil as the crop does, deprive the cane plants from water and nutrients, shade them from light and harbour the harmful insect pests and diseases. The eradication of weeds, therefore, is absolutely essential for obtaining high yields in this crop. Keeping in view the losses caused by weeds in sugarcane the instant study to investigate the problematic weeds and the intensity of their infestation in sugarcane crop in the agro climatic condition of district Charsadda-Pakistan. Secondly, a valuable data will be added to the literature so that with the help of that the weed managers will adopt the appropriate management strategies for controlling concern weeds infesting sugarcane crop. In addition, the collected that will also provides information about the time in which severe infestation occurs in sugarcane.

MATERIALS AND METHODS

Experimental site and design

The study was conducted during the spring of 2021 at the Bacha Khan Agriculture Research Farm, Bacha Khan University Charsadda, that is located at 34.1369° North and 71.8382° East.

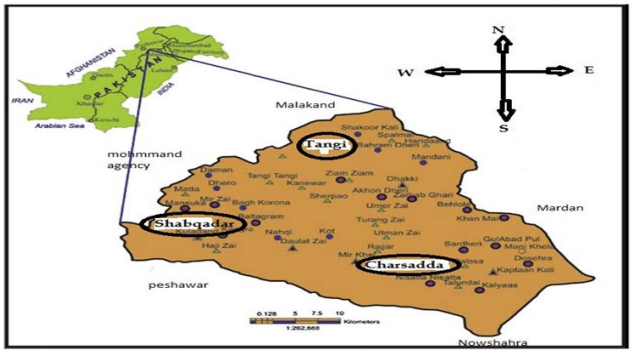

Fig. 1. The site map of district Charsadda-Pakistan (Source: Ullah *et al.*, 2016)

Climate of the site

Charsadda has a Humid subtropical, no dry season climate (Classification: Cfa). The district's yearly temperature is 19.74ºC (67.53ºF) and it is -1.15% lower than Pakistan's averages. Charsadda typically receives about 132.48 millimeters (5.22 inches) of precipitation and has 146.4 rainy days (40.11% of the time) annually.

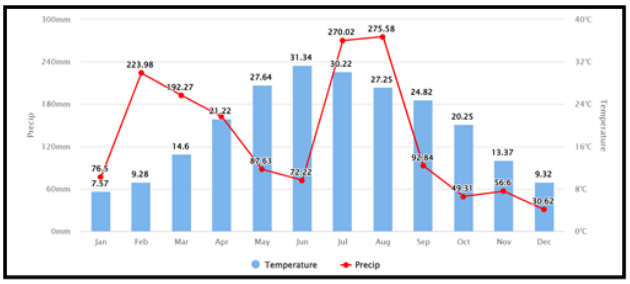

Fig.2. The graph shows the mean monthly temperature and precipitation of the studies area district Charsadda-Pakistan during the study year

Procedure

The weeds were randomly sampled from the experimental fields of Sugarcane fields at the Bacha Khan Agriculture Research farm (BARF) Charsadda KPK by throwing 50 x 50 cm^2 quadrate randomly at 30 different sites. The total area of the experimental plot was 3 hectare. Relative weed density (RWD), relative frequency (RF) and importance value (IV) for each and every weed were calculated during the study.

Formulae

The following formulae were used during the course of study.

$$\text{RDW (\%)} = \frac{\text{Number of weeds of a particular species in a quadrate}}{\text{Total number of weeds in that quadrate}} \times 100$$

Relative Weed Density (RWD)

$$\text{RF (\%)} = \frac{\text{Number of quadrates in which the particular species occurred}}{\text{Total numbers of quadrates thrown}} \times 100$$

Relative weed Frequency (RF)

$$\text{IV (\%)} = \frac{\text{Relative weed density (\%)} + \text{Weed frequency (\%)}}{2} \times 100$$

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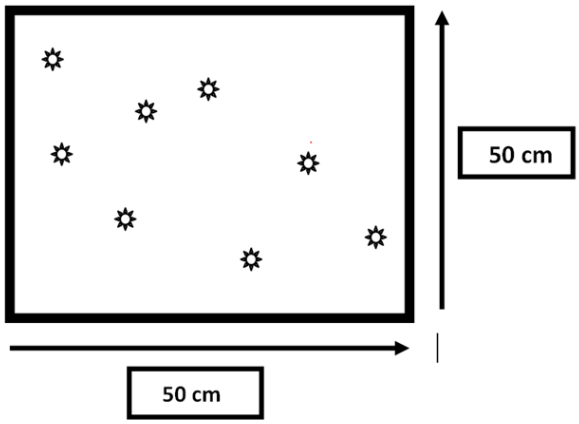

portance value of Weed

Fig. 4 (a, b, c). Data recording during the study in the experimental plots

RESULTS AND DISCUSSION

Relative weed density (%)

The data on relative weed density of weed species is shown in Table-1. The analysis of the data revealed that the field was mostly dominated by weeds; *Cyperus rotundus* L., *Trianthemaportulacastrum*L., *Parthenium hysterophorus*L.*and Brachianreptans*(L.).The infestation by other weeds like *Cynodondactylon* (L.), *Amaranthus spinosus* L. *Amaranthus viridus* L. *and Solunum nigrum* L. were also occurred. It was observed during the study that the Sugarcane field was mostly dominated by Narrow leaf weeds while, it has been observed that the number of grassy weeds were less in the studied sites. Further,the highest relative weeds density (30.21%) was observed for *Cyperus rotundus*L. followed by *Triathemaportulacastrum*L. (16.76%.) while, the lowest RWD recorded for *Portulaca oleracae* L. (0.75%). The reason for the high value of *Cyperus rotundus* L. might be due to the warmth loving nature of that weed and that's why it gave the maximum value because of the high temperature during the study months which provided an ideal condition for the infestation of *Cyperus rotundus*L . In addition the studies area also have high humidity and having good and enough irrigation system that directly encourage the growth and infestation of *Cyperus rotundus*L. as this weed loved moisture and humid conditions. Interestingly, this weed is the noxious weed of rice crop in nearby distract but due to high moisture this weed got adaptation in sugarcane crop also. In similar studies Khalid & Siddiqui (2014) also concluded that*Cyperus rotundus*, is a glabrous perennial sedge, that can grow under various edaphic conditions, preferably in moist soils, and is usually found in wasteland, gardens, orchards, and cultivated areas.

Relative Frequency (%)

The relative frequency of weeds is a good gauge showing the occurrence of weed species in the study area. Among all weed species noted in the study area, the highest relative frequency (46.6%) was observed for *Brachians reptans* (L.). followed by*Parthenium hysterophorus* L. (43%) while the lowest relative frequency (6.60%) was observed for *Portulaca olearacae* L. Whish *et al.* (2016) narrated that losses in Sugarcane yield and yield components increased with increasing density of weeds and weed density increased with increased row spacing. When sugarcane become tellers than weeds than weeds cannot thrive with them as they face the highly completive height plant i.e., Sugarcane.

Table 1. Relative weed density (%) of the weed species of sugarcane in District Charsadda-Pakistan

Weed species	Family	Relative weed density (%)
Cyperus rotundusL.	Cyperaceae	30.21
TrianthemaPortulacastrumL.	Aizoaceae	16.76
Parthenium hysterophorusL	Asteraceae	15.86
Brachiarareptans(L.)	Poaceae	15.25
Cynodondactylon(L.)	Poaceae	8.15
Amaranthus spinosusL.	Amaran-thaceae	4.98
Solanum nigrum L.	Solanaceae	2.71
Convolvulus arvensis L.	Convolvu-laceae	2.4
Physalis minima L.	Solanaceae	2.11
Dactydocteniumaegyptium (L.)	Poaceae	1.96
Amaranthus viridusL.	Amaran-thaceae	1.66
EuphobiaheliscopiaL.	Euphorbia-ceae	0.75
Portulaca oleracaeL.	Portulaca-ceae	0.60

Table 2. Relative weed Frequency (%) of the weed species of sugarcane in district Charsadda

Weed Species	Family	Weed Frequency (%)
Brachiarareptans(L.)	Poaceae	46.6
ParteniumhysterophorusL.	Asteraceae	43
Cyperus RotundusL.	Cyperaceae	40
Physalis minima L.	Solanaceae	33.3
TrianthemaportulacastrumL.	Aizoaceae	30
Amaranthus viridusL.	Amaranthaceae	26.6
Convolvulus arvensis L.	Convolvulaceae	23
Cynodondactylon(L.)	Poaceae	20
Dactydocteniumae gyptium	Poaceae	16.6
Solanum nigrum L.	Solanaceae	13.33
Amaranthus spinosusL.	Amaranthaceae	10
Euphobiaheliscopia L.	Euphorbiaceae	6.66
Portulaca olearacaeL.	Portulacaceae	6.60

Importance value of weeds

The importance value analysis is considered to be a good indicator for the weed flora impeding the associated crop growth. The results showed that the highest importance value (35.1%) was calculated for *Cyperus rotundus* L. followed by *Brachianreptans* (L.) (30.92%) and minimum importance value of the weeds was fo *Portulaca oleracae* L. (3.6%) followed by *Euphobiaheliscopia* L. (3.7%) (Table 3). The remaining weed species carried a relatively lower Importance value except *Parthenium hysterophorus* L. and *Trianthema portulacastrum* L, possessing moderately higher value of 29.43 and 23.8%, respectively (Table 3). *Cyperus rotundus* L. is extensively disseminated over 92 tropical and subtropical countries, causing 23–89% yield losses in more than 50 crops (Bendixen & Nandihalli, 1987). *Cyperus rotundus* is considered a principal weed of cotton (*Gossypium hirsutum* L.), maize (*Zea mays* L.), rice (*Oryza sativa* L.), sugarcane (*Saccharum officinarum* L.), and many vegetables (William & Warren, 1975). Besides this, it has the potential to confine the growth and development of numerous crops through its strong allelopathic interactions (Kadir *et al*., 2000). Furthermore, an efficient C_4 photosynthetic pathway enables *C. rotundus* to assimilate more CO_2 at higher temperatures and light intensities (Santos, 2009), making it more competitive in the efficient utilization of essential growth resources as compared to C_3 weed and crop species (Iqbal & Cheema, 2008).

Table 3. Importance values wise ranking of the weeds of Sugarcane in district Charsadda

Weed Species	Family	IV,s	Rank
Cyperus RotundusL.	Cyperacea	35.1	1
Brachiarareptans (L.)	Poaceae	30.92	2
Parthenium hysterophorus L.	Asteracea	29.43	3
Trianthemaportulacastrum L.	Aizoaceae	23.38	4
Physallis minima L.	Solanaceae	17.7	5
Amaranthus viridus L.	Amaranthaceae	14.13	6
Cynodondactylon (L.)	Poaceae	14.07	7
Convovulus arvensis L.	Convolvulaceae	12.7	8
Dactydocteniumaegyptium (L.)	Poaceae	9.28	9
Solanum nigrum L.	Solanacea	8.05	10
Amaranthus spinosisL.	Amaranthaceae	7.49	11
Euphobiaheliscopia L.	Euphobiaceae	3.7	12
Portulaca oleraceae L.	Portulacaceae	3.6	13

CONCLUSION

From the current investigation it has been concluded that sugarcane field are very much infested by different weed species at district Charsadda-Pakistan particularly by *Cyperus rotundus* L. and *Trianthemaportulacastrum* L. Hence, it has been suggested that these weed must control before sowing of sugarcane setts at District Charsadda. Moreover, the farmers should guide regarding the control of *Cyperus rotundus* L. completely as this weed has underground food storage parts that can be germinated into a new plant easily in next growing season.

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